Fundamental Mechanics: Quiz 5

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Formulae: $v_{fy} = v_{iy} + a_y \Delta t$ $\quad v_{fy}^2 = v_{iy}^2 + 2a_y \Delta y$ $\quad y_f = y_i + v_{iy}\Delta t + \frac{1}{2} a_y \Delta t^2$

$\vec{\mathbf{F}}_{net} = \sum \vec{\mathbf{F}}_i = m\vec{\mathbf{a}}$ $\quad F_G = mg$ $\quad g = 9.80\,\mathrm{m/s^2}$

$f_k = \mu_k n$ $\quad f_s \leqslant \mu_s n$

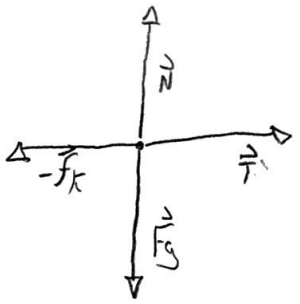
A 200 kg crate lies on a horizontal floor and is pulled by a rope which is horizontal. The crate slides in a straight line with a constant speed of 5.0 m/s. The coefficient of kinetic friction between these surfaces is 0.65 and the coefficient of static friction is 0.75. Determine the tension in the rope.

$M = 200\ kg$

$V = 5.0\ m/s$

$\mu_K = 0.65$

$\mu_S = 0.75$



$\Sigma_x = \vec{T} - \vec{f}_K = 0$

$\vec{T} = \vec{f}_K$ ✓

$\Sigma_y = N - mg = 0$

$N = mg$

f	x	x
$\vec{T}$	$\vec{T}$	0
$-\vec{f}_K$	$-\vec{f}_K$	0
$\vec{F}_g$	0	$-mg$
$\vec{N}$	0	N

$\mu_K(N)$ = kinetic

$\mu_K(1960\ N)$ = kinetic

$\mu_K = 0.65$

$\vec{N} = mg$

$\vec{N} = (200\ kg)(9.8\ m/s^2)$

$\vec{N} = 1960\ N$

$0.65(1960N) = 1274$

$\vec{f}_K = 1274\ N$

$\vec{f}_K = \vec{T}$ ✓

$1274\ N = \vec{T}$ ✓

$\vec{T} = 1274\ N$